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Digitalization of Sharia Pension Funds: Challenges and Opportunities in the Modern Financial Era

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ABSTRACT
The development of financial digitalization has driven a significant transformation in the management of Islamic financial institutions, including Sharia Pension Funds which have the characteristics of long-term fund management and the responsibility to protect the welfare of participants. Digitalization is seen as a strategic instrument to improve the quality of governance, operational efficiency, and transparency in the management of pension funds based on sharia principles. This research aims to analyze the influence of digitalization on the management performance of Sharia Pension Funds in the modern financial era, as well as identify the challenges and opportunities that come with it. The research method uses a quantitative approach by collecting data through a structured questionnaire to managers and participants of Sharia Pension Funds who have utilized digital-based services. The data were analyzed using descriptive statistics and regression analysis to test the relationship between the level of digitization and management performance. The results of the study show that the implementation of digital systems, online services, and technology integration has a positive and significant effect on the performance of Sharia Pension Fund management, especially in terms of accountability, operational efficiency, and service quality. Nonetheless, the level of participant participation and system integration still faces several obstacles. The conclusion of the study emphasizes that digitalization plays an important role in improving the performance of Sharia Pension Fund management, but requires support for the integration of technology, human resources, and Islamic financial literacy so that the benefits can be optimized in a sustainable manner.

Keywords:
Digitalization, Sharia Pension Funds, Performance Management, Sharia Finance, Financial Technology

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1. Introduction

The development of information and communication technology has reshaped organizational processes, business models, and customer interactions, making digital transformation a strategic concern across industries (Vial, 2019)(Verhoef et al., 2021). Within the financial sector, technological innovation is changing the provision of financial services and the relationships between established institutions and emerging financial technology providers (Goldstein et al.,

2019). Artificial intelligence and machine learning offer applications in investment analysis, fraud detection, forecasting, and financial risk assessment (Goodell et al., 2021). Evidence from fintech lending also indicates that alternative data and machine learning can improve credit assessment and potentially extend access to finance (Jagtiani & Lemieux, 2019). Meanwhile, blockchain provides opportunities to redesign financial transactions and information management, although implementation involves technological and organizational challenges (Pal et al., 2021). In Islamic finance, digital innovation must be considered alongside ethical principles and the social objectives of financial services (Rabbani et al., 2021). Accordingly, fintech models should reflect the institutional characteristics of Islamic financial organizations rather than rely solely on the adoption of generic technological solutions (Ascarya & Sakti, 2022). User acceptance also requires attention to perceived benefits, perceived risks, and trust, which are associated with the intention to adopt Islamic fintech (Ali et al., 2021). These developments provide a conceptual basis for investigating digital transformation in Islamic pension funds. Digital tools may support service accessibility, reporting, information provision, and oversight; however, their effects on governance, participants' financial literacy, and trust require direct empirical examination in the Islamic pension fund context.

However, the implementation of digitalization in Islamic pension funds requires attention to participant accessibility, operational resilience, and Sharia compliance. Research on older adults shows considerable variation in internet skills, suggesting that age alone does not adequately explain individuals' ability to use digital services (Hargittai et al., 2019). Older adults also differ in their engagement with informational, social, and instrumental online activities, indicating that internet access does not necessarily translate into effective use of digital services (Schehl et al., 2019). These differences may constrain digital adoption and create unequal access to pension services, particularly among participants who lack suitable devices, reliable connectivity, or the necessary digital skills (Seifert et al., 2021). Moreover, digital inclusion depends on the quality and availability of technological resources, rather than merely the presence of an internet connection (van Deursen & van Dijk, 2019).

Digitalization also introduces cybersecurity and operational risks. Evidence from the financial sector highlights the potential losses associated with cyber incidents and the importance of effective risk management (Aldasoro et al., 2022). Cyberattacks can disrupt financial operations and generate spillover effects through interconnected payment systems, underscoring the need for institutional preparedness and service continuity (Eisenbach et al., 2022). These concerns are relevant to Islamic pension funds because participants depend on secure information processing and reliable access to retirement benefits. Furthermore, research on Islamic fintech identifies perceived benefits, perceived risks, and trust as important factors associated with users' adoption intentions (Ali et al., 2021). Protecting participant information and communicating security measures should therefore receive attention when designing digital pension services, although their effects on pension participants' trust require direct empirical investigation.

From a Sharia governance perspective, technological innovation must be accompanied by appropriate legal arrangements, institutional oversight, and mechanisms for ensuring compliance. Research on Islamic fintech in Indonesia emphasizes the importance of a supportive and coherent legal framework (Muryanto et al., 2022), while comparative evidence highlights the need to strengthen Sharia compliance regulation and supervision (Muryanto, 2023). The integration of technology and Sharia expertise is also important: Mohd Haridan et al. (2023) demonstrate the significance of interaction between Sharia boards and fintech practitioners in developing digital financial products. Similarly, Altwijry et al. (2022) illustrate how Sharia requirements can inform the design of fintech-based financial models. Digital solutions should consequently be adapted to the institutional objectives and operational characteristics of Islamic financial organizations. Applied to Islamic pension funds, these findings suggest the need for an adaptation strategy that combines accessible services, cybersecurity preparedness, staff development, and effective Sharia governance. Whether these measures improve competitiveness, participant trust, and long-term sustainability remains an empirical question requiring investigation in the Islamic pension fund context.

Digitalization in Sharia Pension Funds appears relatively little explored in the literature reviewed here, although research on Islamic financial technology has developed considerably in recent years (Maniam, 2024). Existing studies focus extensively on Islamic banking and finance, while a growing strand examines Islamic fintech and digital financial services (Alshater et al., 2021; Biancone et al., 2020). Digital technology can expand access to Islamic finance and support sustainable development (Mohamed & Otake, 2025). However, the reviewed studies provide limited direct evidence on the digitization of sharia pension services, conceptually and empirically.

Sharia Pension Funds require focused examination of their long-term characteristics, fund management complexity, and participants' specific needs. This perspective matters because research outside Islamic finance identifies relationships between financial pension security, digital literacy, and older adults' well-being (Luan et al., 2025). Limited empirical coverage leaves an incomplete understanding of digitalization's implications for governance, sharia compliance, and participant service quality. Research identifies customers, technology developers, financial institutions, government, and fatwa as important elements of the Islamic fintech ecosystem, but their relevance requires further examination in pension institutions (Hudaefi et al., 2023).

These limitations suggest a gap between technological development and directly applicable evidence concerning Sharia Pension Funds. The reviewed literature also provides limited direct evidence connecting pension digitalization with system sustainability, participants' rights, and Islamic financial social and ethical goals. Nevertheless, Islamic fintech lending demonstrates how digital services can promote inclusion and selected sustainable development goals, offering a starting point for pension research (Hudaefi, 2020). More targeted research is therefore needed to examine these relationships and develop an analytical framework reflecting Islamic pension institutions' distinctive characteristics. Such research should investigate institutional processes and participant experiences while accounting for differences in their operational contexts, consistent with broader calls to address unresolved issues in Islamic banking and finance research (Narayan & Phan, 2019).

The empirical and conceptual studies reviewed here generally identify opportunities and challenges of digitalization in general, or are placed in the broader context of financial institutions rather than Sharia Pension Funds. The focus of these studies tends to highlight aspects of service innovation, operational efficiency, and increasing technology-based financial inclusion, without necessarily addressing the unique characteristics of Sharia Pension Funds, which have a long-term orientation and responsibility for protecting the welfare of participants (Kou & Lu, 2025). As a result, existing research findings cannot, on their own, formulate a digitalization framework that is specifically able to answer the needs of governance, risk management, and sharia compliance in pension fund management. Relevant literature emphasizes the importance of applying transparent and accountable governance principles as a foundation for the management of Islamic financial institutions (Ab Ghani et al., 2024), alongside the need to build business models that are adaptive to the development of digital technology. This emphasis is associated with efforts to maintain the harmony of financial activities with maqāṣid al-sharia, especially property protection, distributive justice, and the sustainability of social welfare (Mergaliyev et al., 2021). However, these discussions do not directly establish the effectiveness of digital technology implementation strategies in Sharia Pension Fund institutions, even where empirical evidence is available for other Islamic financial institutions. Although pension research has examined the integration of blockchain and business process management outside the Islamic finance context (Kovács et al., 2024), the literature reviewed here does not establish a comprehensive operational model specifically integrating membership administration, investment management, financial reporting, and sharia compliance supervision in Sharia Pension Funds. This condition indicates that the development of the Sharia Pension Fund literature still requires a more specific, contextual, and applied research approach so that digitalization is understood as a strategic instrument to strengthen the governance and sustainability of the Islamic pension system.

This research is directed to fill the study gaps that are still open through the formulation of the main challenges and strategic opportunities that arise along with the application of digitalization in the management of Sharia Pension Funds in the modern financial era that continues to undergo changes. This research seeks to provide a strong conceptual basis for the development of a

digitalization model that is not only oriented towards technical efficiency, but also in line with sharia principles that emphasize the value of trust, fairness, and sustainability of fund management. The main focus of the research lies in efforts to map the actual conditions of the application of digital technology in Sharia Pension Funds, including aspects of institutional governance, membership administration system, investment management mechanisms, and reporting and supervision patterns used. In addition, this study also examines various obstacles faced in the digitalization process, both stemming from limited infrastructure, human resource capacity, regulatory readiness, and the level of digital literacy of retired participants. This study is further directed at identifying strategies for the use of digital technology that has the potential to increase participant participation, improve operational efficiency, and strengthen accountability and transparency in the management of Sharia Pension Funds. This approach is expected to be able to illustrate the relationship between digitalization and efforts to protect the interests of pension participants in a sustainable manner. Through this comprehensive mapping, this research contributes to the enrichment of Islamic finance literature, especially related to the development of Sharia Pension Funds that are adaptive to technological developments. The results of the research are also expected to be a reference for pension fund managers, regulators, and other stakeholders in designing digitalization policies and strategies that are responsive to modern financial dynamics while being consistent with Islamic values.

2. Methods

This study uses a quantitative approach with the aim of analyzing the influence of digitalization on the management performance of Sharia Pension Funds in the modern financial era. The main focus of the research is directed at measuring the relationship between the level of digitalization implementation and the quality of Sharia Pension Fund management which is reflected through participant participation, operational efficiency, and management accountability. The independent variable of the study is the digitization of the Sharia Pension Fund which is operationalized through indicators of the use of digital information systems, technology-based services, and the integration of reporting and administrative systems. The dependent variables of the study include the management performance of the Sharia Pension Fund as measured through the level of participant participation, the efficiency of the management process, and the transparency of financial statements based on sharia principles.

The research targets include officially operating Sharia Pension Fund institutions as well as active participants of Sharia Pension Funds in the specified research area. The research population is all managers and participants of Sharia Pension Funds who have utilized or been exposed to digital-based services. The sampling technique uses the purposive sampling method with the criterion that respondents have experience interacting with the technology-based Sharia Pension Fund service system. The research data was collected through the distribution of a structured questionnaire prepared using a five-point Likert scale to measure respondents' perception of the research variables. In addition, supporting data is obtained through documentation of institutional reports and official publications of the Sharia Pension Fund institution.

The research model was compiled to describe the causal relationship between the digitalization of Sharia Pension Funds and management performance that reflects the principles of sharia governance. The development of the research was carried out through the formulation of variable indicators based on the latest literature review and adjustments to the characteristics of the Sharia Pension Fund institution. This model is designed to capture the direct influence of the application of digital technology on improving the quality of pension fund management in a quantitative and measurable manner.

The data analysis technique uses descriptive statistical analysis to describe the characteristics of respondents and research variables, as well as inferential statistical analysis to test the relationship between variables. Validity and reliability tests were carried out to ensure the quality of the research instruments, followed by multiple linear regression analysis to measure the influence of digitalization on the performance of Sharia Pension Fund management. All data processing is carried out using relevant statistical software so that the results of the analysis can describe the empirical relationship between variables objectively and systematically.

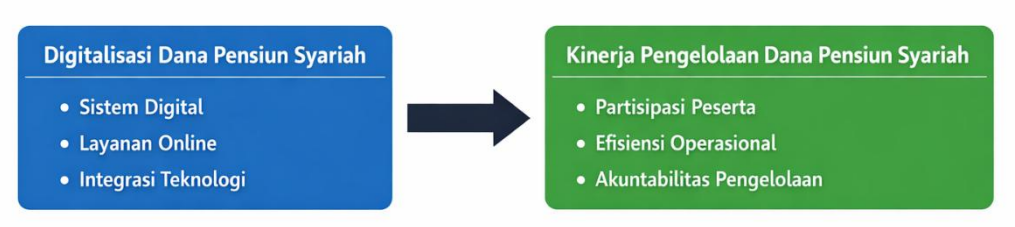

Figure 1. Digitization of Sharia Pension Funds on Management Performance

3. Results

The results of descriptive statistical analysis show that the level of digitalization implementation in Sharia Pension Funds is in the high category based on respondents' assessments. The digitalization variables of the Sharia Pension Fund are measured through three main indicators, namely digital systems, online services, and technology integration. Of the three indicators, the digital system obtained the highest average score, which reflects that respondents in general have felt the existence and use of information technology-based systems in the pension fund management process.

Online service indicators also show relatively high average values. This finding illustrates that respondents consider that digital-based services have provided convenience, especially related to access to membership information and administrative services of the Sharia Pension Fund. Meanwhile, the technology integration indicator recorded a fairly good average score, although it still showed a variation in assessment between respondents. This variation is mainly related to the level of integration between the internal system of pension fund managers and the external systems that support the operation of digital services.

In addition to the digitization variables, descriptive statistical analysis was also carried out on the performance variables of the management of the Sharia Pension Fund. This variable is measured through three performance indicators, namely participant participation, operational efficiency, and management accountability. The results of data processing showed that respondents generally gave a positive assessment of the performance of the management of the Sharia Pension Fund, which was reflected in the average value of each indicator which was in the high category.

Overall, descriptive statistical analysis was used to describe the tendency of respondents' answers to each research variable, both the digitization variable of the Sharia Pension Fund and the variable of its management performance. A summary of the descriptive statistical results of the research variables is then presented in the Table 1.

Table 1. Descriptive Statistics on the Digitization of Sharia Pension Funds

Digitization Indicators	Minimum Score	Maximum Value	Average	Category
Digital System	3,20	4,80	4,21	Height
Online Services	3,00	4,75	4,10	Height
Technology Integration	2,90	4,60	3,98	Height
Total Average			**4,10**	Height

Descriptive Statistics of Sharia Pension Fund Management Performance Variables

Inferential analysis was carried out to test the relationship between the digitization of Sharia Pension Funds and the performance of Sharia Pension Fund management in accordance with the research model that has been formulated. The test was carried out using regression analysis to determine the direction and significance of the influence between variables. The test results show that the digitalization of Sharia Pension Funds has a positive and significant effect on the performance of Sharia Pension Fund management (Siregar et al., 2025).

The value of the regression coefficient with a positive value shows that the increase in the implementation of digital systems, online services, and technology integration is followed by an improvement in the management performance of the Sharia Pension Fund. The increase is reflected in the aspects of participant participation, operational efficiency, and management accountability based on respondents' assessments. The results of the statistical significance test showed that the research model met the set testing criteria. A summary of the results of the next research model test is presented in the following table:

Table 2. Descriptive Statistics on Sharia Pension Fund Management Performance

Performance Indicators	Minimum Score	Maximum Value	Average	Category
Participant Participation	3,10	4,70	4,05	Height
Operational Efficiency	3,25	4,85	4,23	Height
Management Accountability	3,30	4,90	4,28	Height
Total Average			**4,19**	Height

4. Discussion

The results of the study show that the digitalization of Sharia Pension Funds has a positive and significant influence on the performance of Sharia Pension Fund management. These findings strengthen the argument that digital transformation is a strategic factor for improving the quality of management of Islamic financial institutions in the modern financial era. In line with recent research developments, digitalization is seen as an important instrument with the potential to improve the efficiency, transparency, and effectiveness of fund management. Supporting evidence from Islamic rural banks links digital transformation with corporate governance, financial performance, and business sustainability (Siswanti et al., 2024), while evidence from European banks associates digital transformation with higher profitability, particularly through IT and network efficiency (Citterio et al., 2024). These findings provide relevant comparisons, although they do not directly establish the same relationships in sharia pension institutions.

The digital system indicator that obtained the highest average score suggested that respondents perceived benefits from the existence of an information technology-based system in the Sharia Pension Fund management process. The implementation of the digital system is considered to be able to support the smooth running of administrative activities, transaction recording, and membership data management in a more structured and systematic manner. This condition is consistent with previous research highlighting the importance of data and information quality in supporting better decision-making through digital accounting systems in banks (Al-Okaily et al., 2023). Evidence from Chinese listed companies also indicates that digital transformation can improve internal control quality, although its effects vary across transformation stages (Cheng et al., 2024). In the present study, the existence of a digital system may also allow Sharia Pension Fund managers to monitor and evaluate performance on an ongoing basis, thereby supporting the creation of more accountable and efficient governance.

The high average score on the online service indicator suggests that respondents perceived ease of access to information and administrative services as one of the benefits of implementing digitalization in the Sharia Pension Fund. Online-based services allow participants to obtain information on membership, fund status, and administrative processes more quickly and practically, with fewer geographical and time constraints. This condition reflects participants' positive assessments of online service accessibility, although the extent of improvement requires comparison with previous service conditions. These findings are consistent with previous research showing that perceived ease of use and usefulness influence the acceptance of Islamic financial technology services (Shaikh et al., 2020). Research on Islamic online banking also identifies efficiency, reliability, responsiveness, and security as important factors associated with customer satisfaction, supporting the relevance of accessible and responsive online platforms for financial service users (Gazi et al., 2024).

Meanwhile, the technology integration indicator showed a fairly good score, although there were still variations in assessments between respondents. This condition suggests that respondents

did not perceive the level of integration between the internal system of Sharia Pension Fund management and external operational support systems uniformly. Differences in technology readiness, system capacity, and infrastructure support are possible explanations for these variations, rather than causes established by the descriptive results alone. These findings are consistent with research on the digital transformation of financial institutions, which highlights system integration and the coordination of technological and organizational capabilities as important challenges in the digitalization process (Papathomas & Konteos, 2024). The literature emphasizes that successful digitalization requires more than technology adoption, including appropriate infrastructure, coordinated processes, and the integration of systems and organizational capabilities. For Sharia Pension Funds, these technical requirements must additionally be considered alongside the harmonization of technology with the sharia principles underlying institutional operations.

In the management performance variable of the Sharia Pension Fund, the management accountability indicator obtained the highest average value. These findings suggest that respondents perceived accountability as a particularly strong aspect of fund management in the context of digitalization. Recent literature highlights the potential of digital systems to reshape reporting, information accessibility, and accountability, while emphasizing that these benefits depend on how digital information is produced and used (Agostino et al., 2022). Although this literature concerns public services, it provides a relevant perspective for interpreting accountability in pension fund management.

The operational efficiency indicator also showed high results, which is consistent with previous research associating financial technology with improved efficiency in the banking sector (Ahmad et al., 2025). The application of digital technology may allow Sharia Pension Fund managers to reduce reliance on manual processes, increase the speed of data processing, and improve coordination between work units. These mechanisms could contribute to increasing the productivity and effectiveness of pension fund management as a whole. Empirical evidence from Malaysian banks indicates that FinTech innovation improves efficiency, although its effects vary according to bank characteristics. Research on digital zakat payments also emphasizes the importance of accessible payment systems, organizational and technical infrastructure, and user literacy, rather than demonstrating that technology alone guarantees efficient fund management (Kasri & Yuniar, 2021). These findings indicate that digitalization is a potentially important instrument for improving the operational efficiency of Islamic financial institutions.

On the other hand, the participant participation indicator showed a relatively lower value than other performance indicators, although it was still in the high category. These findings indicate that participant participation was assessed less strongly than other performance dimensions, rather than establishing that digitalization had failed to increase participation. This condition is consistent with literature suggesting that participation is not only influenced by the availability of digital technology, but also by participants' understanding of the characteristics and benefits of Islamic financial products. Research on Islamic securities crowdfunding finds that Islamic financial literacy significantly influences prospective investors' behavioral intentions and emphasizes the importance of product and contract literacy (Majid & Nugraha, 2022). Research on digital zakat payments similarly identifies literacy and facilitating conditions as significant determinants of intention to use online platforms (Kasri & Yuniar, 2021). Therefore, strengthening Islamic financial literacy is an important supporting consideration for optimizing the potential contribution of digitalization to participant participation.

Overall, the results of this study expand the empirical study of Islamic finance digitalization by presenting evidence in the context of Sharia Pension Funds. The findings suggest that digitalization has a strategic role in improving management performance, particularly regarding efficiency, accountability, and service quality to participants. At the same time, technology integration and participant participation still require special attention. These findings suggest that future digitalization strategies should consider system readiness, human resources, policy support, and Islamic financial literacy alongside technology adoption, although the individual contributions of these supporting factors require further empirical examination.

5. Conclusion

Digitalization has a strategic role in improving the performance of Sharia Pension Fund management in the modern financial era. Based on empirical findings, the application of digital systems, online services, and technology integration has been proven to be able to strengthen the quality of pension fund management through increased accountability, operational efficiency, and service quality to participants. Digitalization allows the administration, recording, and financial reporting processes to be carried out in a more structured, transparent, and responsive manner to the needs of stakeholders, thereby supporting governance principles that are in line with the value of trust and transparency in Islamic finance. These results consistently answer the formulation of problems and research objectives that focus on the relationship between digitalization and the performance of Sharia Pension Fund management, while strengthening the findings of the Islamic finance literature that places digital transformation as an important factor in improving institutional performance.

In addition, this study also shows that the success of the digitalization of Sharia Pension Funds is not only determined by the availability of technology, but also influenced by the level of system integration, the readiness of human resources, and the digital literacy and sharia finance of participants. Although management performance in general is in the high category, there are still challenges in the aspects of participant participation and system integration that require further attention. This finding provides an academic contribution by expanding the empirical study of Islamic financial digitalization in the context of Sharia Pension Funds, which has been relatively limited in the literature. Practically, the results of this study are expected to be a reference for pension fund managers, regulators, and related stakeholders in formulating digitalization policies and strategies that are not only oriented towards technical efficiency, but also support sustainability, participant protection, and consistency in the application of sharia principles in the management of Sharia Pension Funds in the future.

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